

FARMING FUEL



Ethanol and
Biodiesel
Impacts in
Missouri

2007

INCREASED SECURITY FEEDING A HUNGRY WORLD SAVING THE PLANET'S CLIMATE BRINGING ECONOMIC DEVELOPMENT & GROWTH

We are asking a lot from small soybeans and little kernels of corn and from the men and women who grow them. But these are the very high stakes that make people so passionate about the biofuels industry.

Biofuels are derived from biomass — recently living organisms or their byproducts.

Ethanol, derived from corn, is the most common biofuel in the U.S. while biodiesel is gaining ground as a substitute for petroleum diesel and usually comes from soybean oil.

Promoting the demand for biofuels in Missouri is a measure which requires all gasoline sold in the state to contain a minimum of 10 percent ethanol by 2008. A similar law is being considered for diesel fuel sales. The state also provides monetary incentives and tax credits to investors for the construction of ethanol and biodiesel plants.

This study looks at the effects of state support for biofuels.

The analysis finds biofuel production brings many positive impacts to Missouri's economy. It creates jobs, increases farm incomes, and generates more than a half billion in new economic activity.

The state's investment in biofuels also provides important support to agribusiness, furthers energy independence, and offers opportunities for rural economic development.



Analysis of current biofuel plants and those due to come on-line by 2008 show the potential for great gains to Missouri's economy. Over a ten year period the 11 ethanol and 10 biodiesel plants create more than 6,600 new jobs, nearly \$500 million in new personal income, and more than half a billion in new economic activity annually.

Biofuel Impact Summary

Over 10 years, every dollar invested in this industry returns:

- \$0.42 in net general revenues to the state totaling (\$165) million
- \$17.34 in new personal income to Missourians totaling \$4.9 billion
- \$19.08 in new economic activity / output to the state economy totaling \$5.4 billion

On average each year, this industry creates:

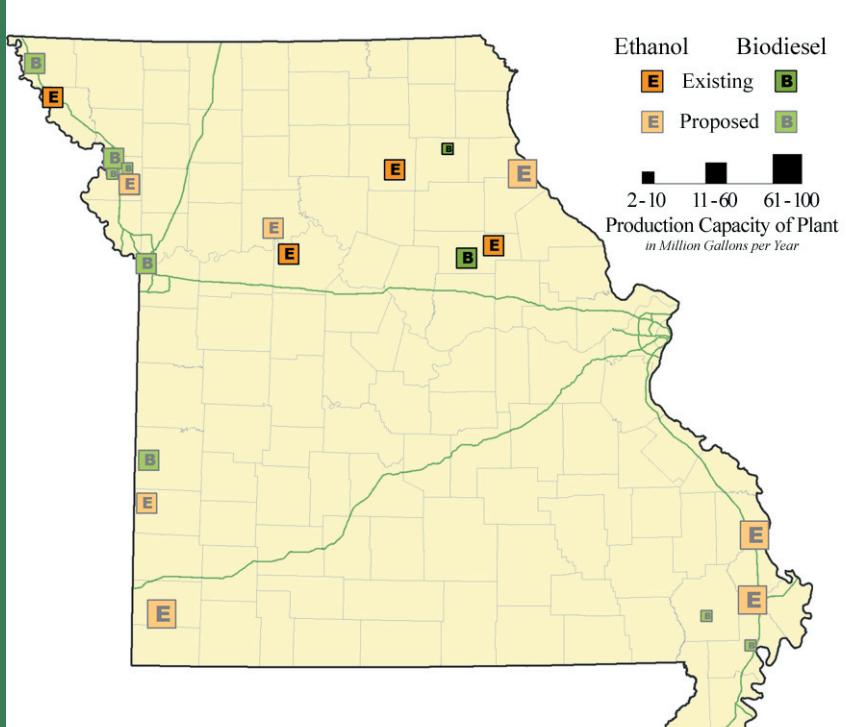
- 6,670 new jobs paying an average wage of \$24,989
- (\$16.5) million in net general revenues on average each year
- \$494 million in new personal income on average each year
- \$544 million in new economic activity / output on average each year

Every dollar the state invests in the biofuel industry returns more than \$17 in personal income.

This large impact is aided by the fact that most plant investors are Missourians and therefore spend much of their new income in state. Corn and soybean farmers also gain additional profits from a higher demand for their products.

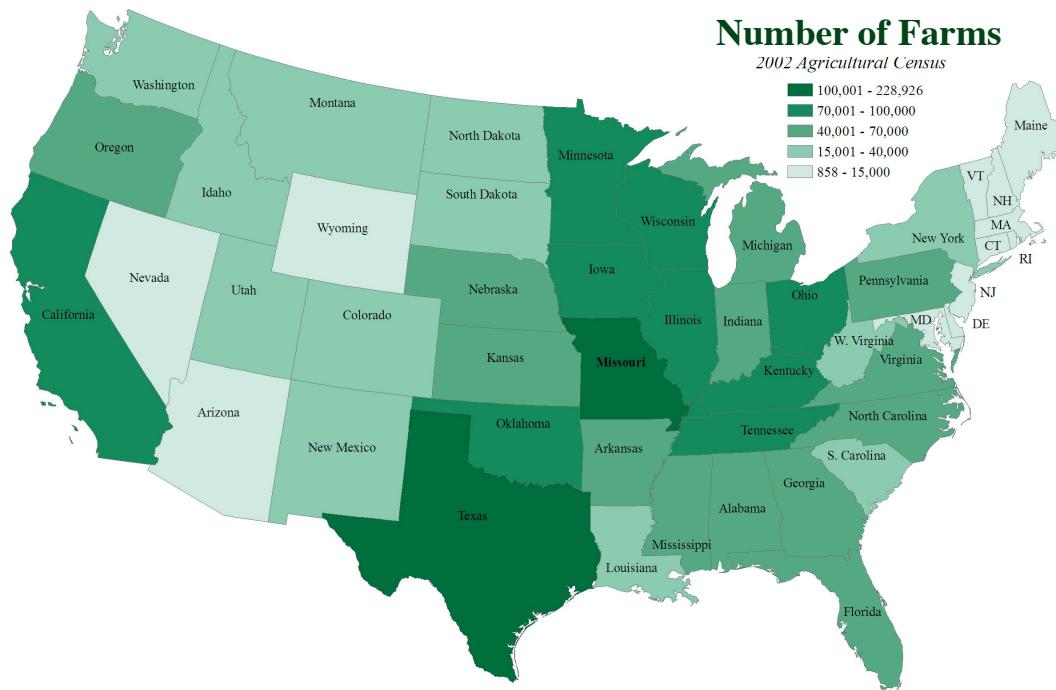
The State of Missouri will initially be underwriting part of the cost for the development of this industry, with \$325 million in anticipated state incentives and tax credits. The state makes back a bit less than half of its investment over the study period.

Missouri Biofuel Plants



Biofuel plants help grow Missouri's economy.

Missouri has always been a leader in agribusiness, with the second most number of farms of any state in the U.S. Our state's farmers rank among the nation's top producers of hay, rice, soybeans, cattle, hogs, turkeys, and ice cream. And despite the trend toward corporate farming, Missouri remains a family-farm state.



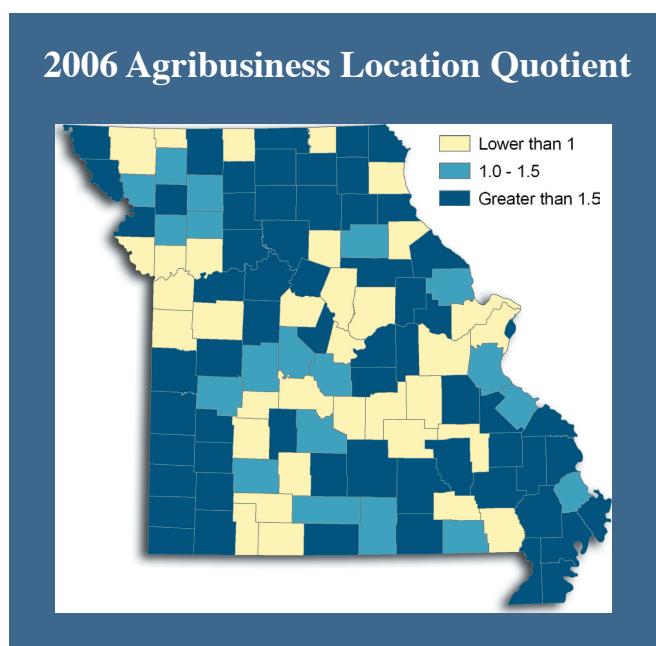
Over 200,000 people are employed in direct farm production and farm-related industries in Missouri. This ranks in the top ten in the U.S for total agri-business employment.

The Location Quotient (LQ) map shows counties with higher concentrations in agribusiness employment than the national average ($LQ > 1$).

Location Quotient Equation (a Ratio of Ratios)

$$\left(\frac{\text{County Employment}_{\text{INDUSTRY}}}{\text{County Employment}_{\text{TOTAL}}} \right) \div \left(\frac{\text{National Employment}_{\text{INDUSTRY}}}{\text{National Employment}_{\text{TOTAL}}} \right)$$

Missouri agribusiness is widely distributed throughout the state and has a statewide LQ of 1.2. This means Missouri is more specialized in agribusiness than most other states.



Missouri remains a family-farm state.

Missouri agriculture can excel in producing food, fiber and fuels.

To encourage farmers to benefit from biofuel profits, Missouri requires that state biofuel incentives go only to plants that are majority farmer-owned. Targeting incentives in this manner promotes gains to Missouri income that may not occur if plant profits accrue to out-of-state investors.

The analysis below considers the difference in economic impact of ethanol and biodiesel facilities that are owned by out-of-state investors versus those who are from Missouri.

A 50 million gallons per year (mgy) ethanol plant owned solely by in-state investors adds 300 additional jobs to Missouri's economy as opposed to owners who take profits out of state.

A typical 30 mgy biodiesel plant would create 267 additional jobs by being in-state rather than out-of-state owned.

Seventy percent of the biofuel plants located in Missouri by 2008 will be in-state investor owned.

What Difference Can One Typical 50 mgy Ethanol Plant Make?

Additional impact of profits that accrue to in-state rather than out-of-state investors:

	10-Year Avg
ADDITIONAL AVG. ANNUAL EMPLOYMENT	300 jobs
ADDITIONAL PERSONAL INCOME	\$293 million

New personal income to Missourians for every gallon produced:

	10-Year Avg
100% IN-STATE INVESTORS	\$0.82
100% OUT-OF-STATE INVESTORS	\$0.17
<i>Difference</i>	\$0.65

What Difference Can One Typical 30 mgy Biodiesel Plant Make?

Additional impact of profits that accrue to in-state rather than out-of-state investors:

	10-Year Avg
ADDITIONAL AVG. ANNUAL EMPLOYMENT	267 jobs
ADDITIONAL PERSONAL INCOME	\$278 million

New personal income to Missourians for every gallon produced:

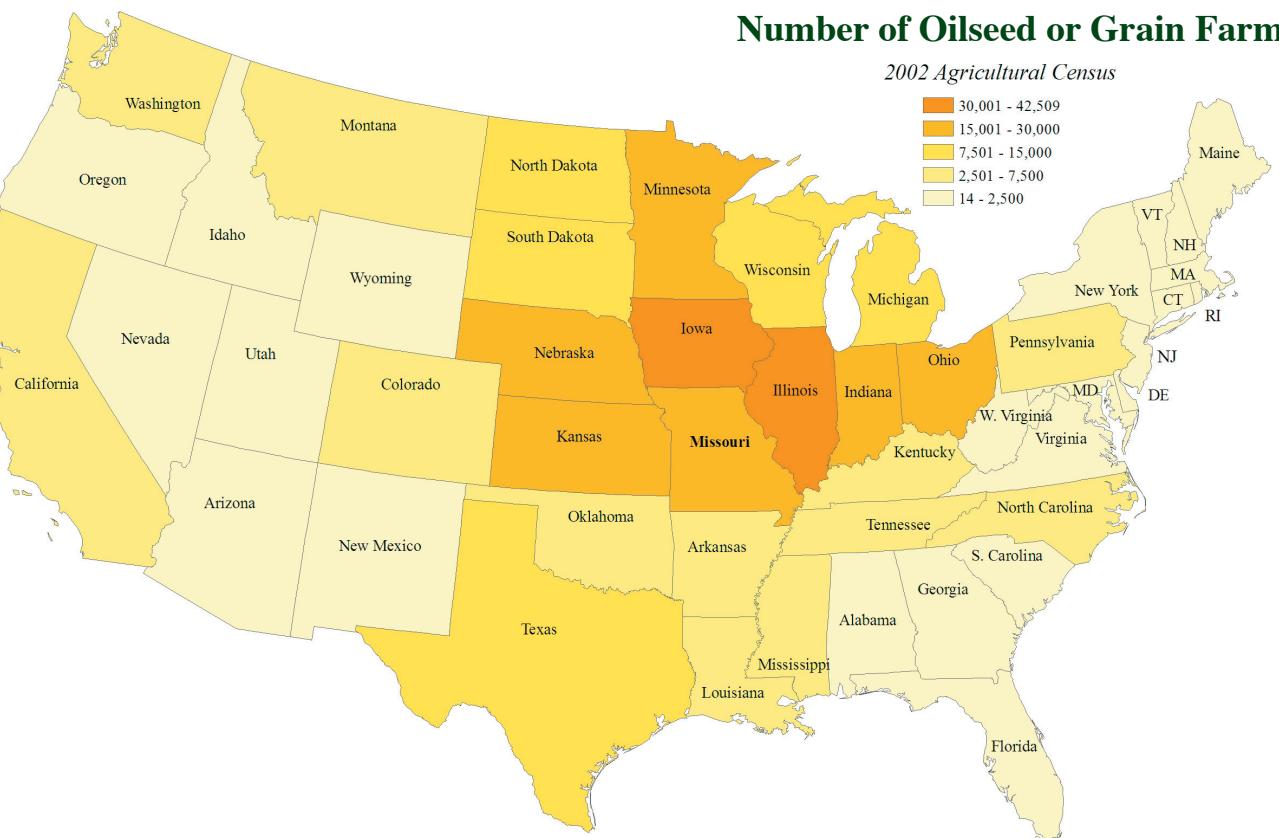
	10-Year Avg
100% IN-STATE INVESTORS	\$1.16
100% OUT-OF-STATE INVESTORS	\$0.13
<i>Difference</i>	\$1.03

Biofuels keep farming a leading Missouri industry.

Like the rest of the United States, Missouri relies heavily on fossil fuels – coal, petroleum, and natural gas – for its energy. The Missouri Department of Natural Resources reports that 93 percent of the state’s energy needs are met by these nonrenewable fuel sources. Since Missouri has very limited fossil fuel resources this means that nearly all of the coal, petroleum, and natural gas we use must be imported.

Relying on energy imports to power our state's economy is a big concern and a reason why we want to develop a more self-reliant energy sector.

Compounding the problem, to continue to meet our state's power needs, fossil fuel imports into Missouri would have to more than triple by mid-century. However, the Midwest, and Missouri in particular, is poised to supply the fast growing ethanol and biodiesel alternative energy markets.



Missouri relies heavily on fossil fuel imports.

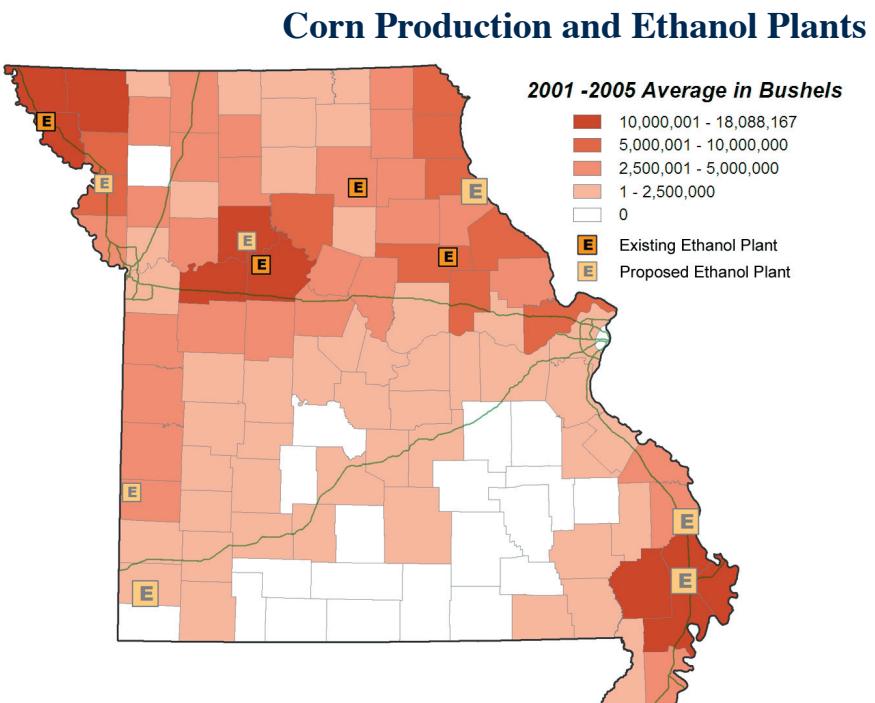
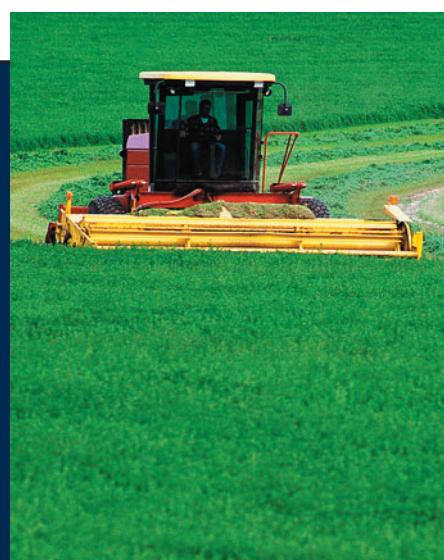
Biofuels can break us of our carbon diet and bring us more energy self-reliance. Missouri can also help America grow its own fuel.

Missouri has four existing ethanol plants with a capacity of 163 million gallons, with seven additional plants planned in the next couple of years.

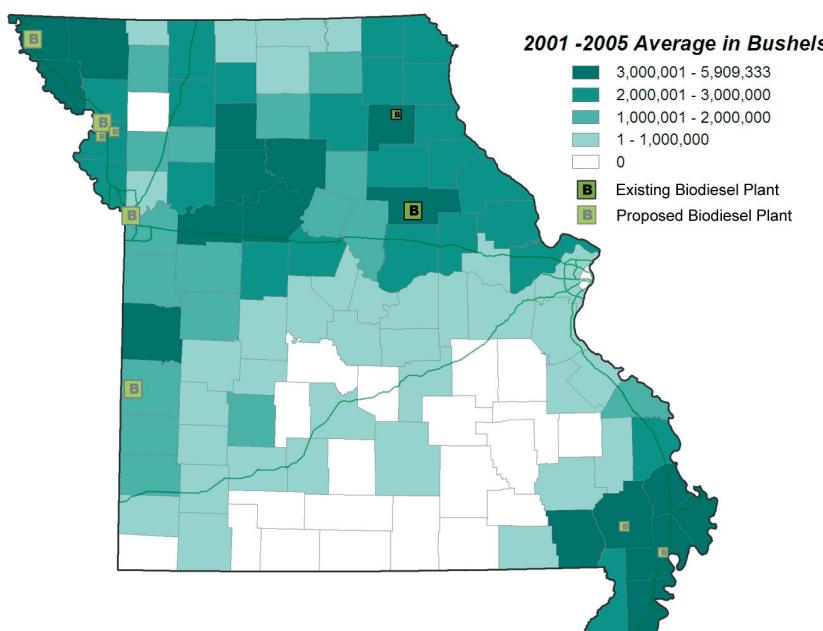
By 2008, Missouri's eleven plants will have a total ethanol production capacity of nearly 800 million gallons per year.

Missouri currently has two biodiesel plants with a capacity of 32 million gallons. Eight additional plants are in the planning stages.

Missouri will have ten plants with the capacity to produce over 200 million gallons of biodiesel a year in 2008.



Soybean Production and Biodiesel Plants



Biofuels can bring more energy self-reliance.

Biofuels can help rural economic development efforts and balance economic growth in the state.

The economic share map illustrates how concentrated economic activity is in Missouri.

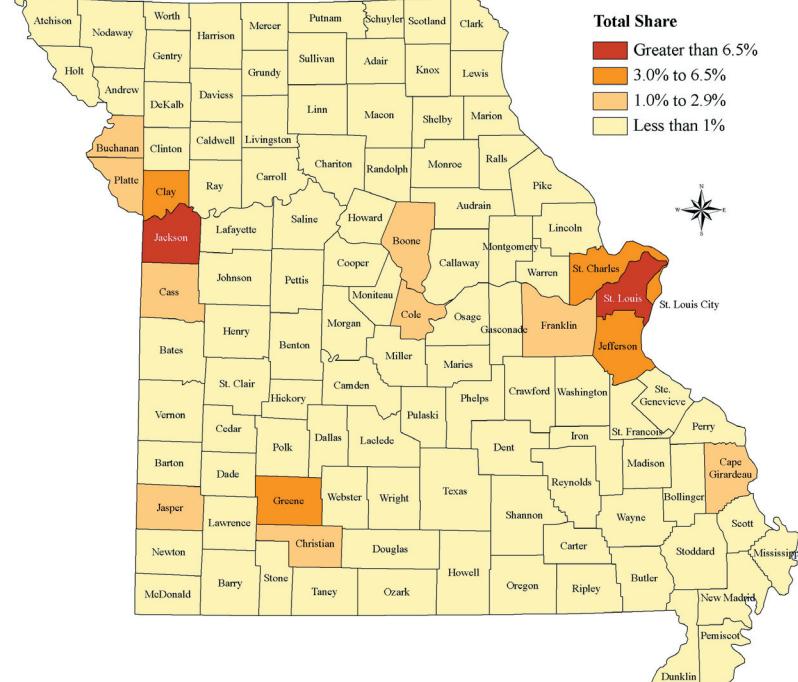
Economic share is the average of the percentage of the state's employment, population, and personal income that occurs in a particular county.

One-third of Missouri's economy is in St. Louis and Jackson counties...so all counties are not created equal.

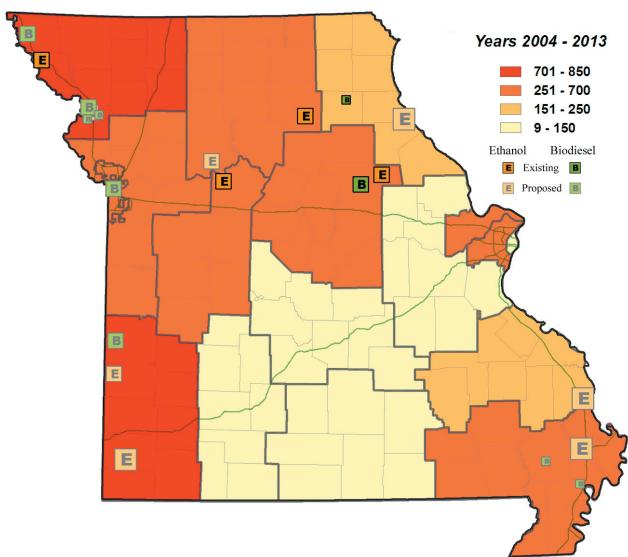
Economic impact is like a wave that starts with a big splash at the initial location, causes bigger waves the closer you are to the splash and gradually fades with distance.

In this case, the economic impacts are more concentrated in the state's rural regions.

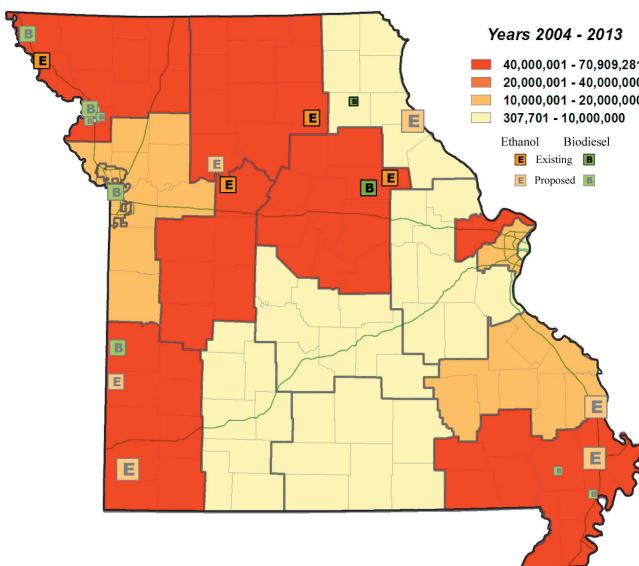
Missouri Economic Share Map



Average Annual Personal Income Impact



Average Annual Employment Impact



Economic impacts move like a wave.

Biofuel plants bring positive economic benefits to rural regions of our state. Local people are employed; local crops are purchased; local businesses increase sales; and local tax bases are expanded.

Northeast Missouri (NEMO) Grain in Macon, Missouri, is one of the state's active ethanol plants. The plant began operation in May of 2000 and is 82 percent owned by a group of 311 Missouri corn farmers.

The plant makes about 46 million gallons of ethanol each year and employs 40 people and several part-time positions. All of the employees live in and around the Macon area.

NEMO Grain uses 43,000 bushels of corn each and every day of the year, or 15.5 million bushels annually.

A trucking company has sprung up next to the plant to ship the valuable Carbon Dioxide co-product to various buyers. This created more jobs and local gas purchases.

NEMO Grain has also entered into a very unique joint venture with the City of Macon on a natural gas-fired turbine generator, or "Energy Center." The project includes a 10 megawatt electric generator, which generates most of the power required by the City of Macon, and a large steam boiler, which is fired from the exhaust waste heat from the jet engine that powers the generator. About 60 percent of the ethanol plant's steam requirements come from this boiler.



Biofuel plants benefit rural Missouri.

Biofuel Issues: An Evolving Industry

The knowledge of biofuel production has existed for more than a century, however, the industry is still considered in its early stages. With continued government support and construction of biofuel processing plants throughout the Midwest, this industry is growing fast. While it seems promising, it is also important to be aware of factors that may affect this industry's early stage growth as well as the related effects the industry has on other sectors.

Food Prices:

The use of corn and soybeans in biofuel production limits the supply of feedstock available to meat and dairy producers. In the short term, meat and dairy prices may increase by the cost of importing feedstock. As processes become more efficient in the production of feedstock from byproducts of biofuel, prices of meat and dairy products should decline.

Also, the increased profit margin for growing corn and soybeans may result in farmers converting acreage dedicated to other crops to growing solely corn and soybeans. Vegetable and fruits previously supplied locally would then need to be imported, most likely at a higher price.

Technology:

As more biofuel plants become operational, technological advances in the efficiency of ethanol and biofuel production are expected. These advances would help the industry stay competitive. However, other competing types of biomass, such as switch grass, may become more favorable as new developments in processing are discovered. In addition, advances with other energy sources, such as hydrogen power, may create strong competition for the biofuel industry.

Oil Prices:

A major factor affecting profits in biofuel production is the interaction of the price of oil with the price of corn and soybeans. When the price of crude oil drops, for example, the price of corn can remain the same making the ethanol additive more expensive to the consumer than actually using only gasoline.

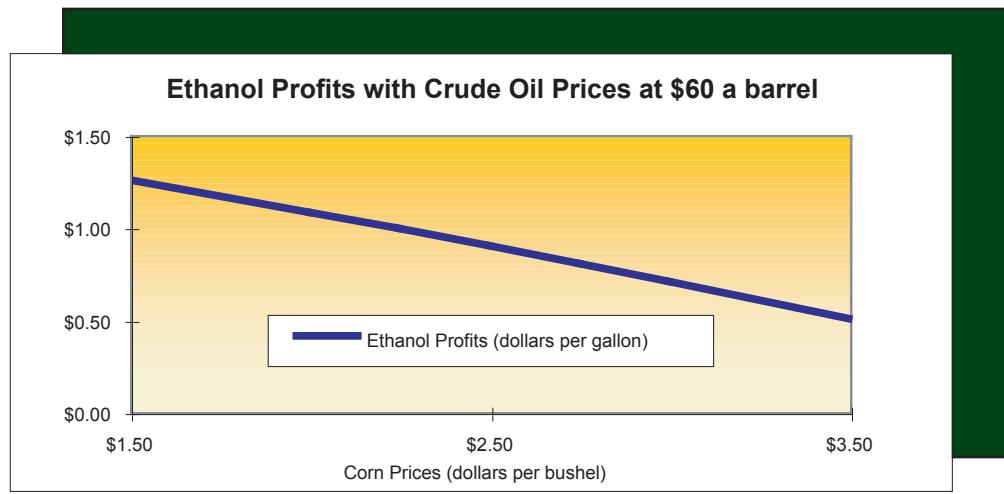


Chart created from Federal Reserve Bank of Kansas City, *The Main Street Economist*, 2007 Volume 2

Impact Modeling Assumptions

- Biofuel industries are classified as chemical manufacturers in the North American Industry Classification System (NAICS). The standard chemical industry production function was modified to more closely model ethanol and biodiesel plants. The IMPLAN model was used to determine intermediate input proportions by examining industries more similar to ethanol and biodiesel production than chemical manufacturing. These modifications were then modeled using REMI economic impact software to determine long-term effects.
- Construction of existing and proposed biofuel plants totals \$1.4 billion from 2004 - 2013. Missouri construction firms receive 35 percent of that revenue (\$499 million) because much of the biofuel plant construction is done by specialized national firms. Earthwork and basic construction activities would likely utilize local Missouri firms.
- An estimated 644 jobs in biofuel manufacturing will occur as all plants come online by 2008. Average wage of \$37,300. Employment and wage data was provided by the Missouri Department of Agriculture from biofuel industry disclosed estimates of current and future projects.
- Missouri Department of Agriculture biofuel incentives estimated at \$306 million. These incentives lower production cost to biofuel manufacturers by the same amount. Tax credits to biofuel investors estimated at \$18.8 million of which \$16.4 million accrue to in-state investors.
- Federal tax credits for biodiesel and ethanol production are extended beyond current 2008 and 2010 expiration dates.
- 2.766 billion in dividends to Missouri plant investors between years 2004-2013. Dividend calculation based on knowledge of where existing and planned plant investors are likely to be located.
- 370 million in income to Missouri farmers, between years 2004-2013, due to crop premiums biofuel manufacturers pay to feedstock producers. One fifth of the premium income was assumed to be disposable income, and the remaining was reinvested in farm-related equipment and services.

Sources

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Missouri Economic Research and Information Center

Missouri Department of Economic Development

www.MissouriEconomy.org

